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Solar Inactivation of Enterococci and *Escherichia coli* in Natural Waters: Effects of Water Absorbance and Depth

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ABSTRACT

The decay of sewage-sourced *Escherichia coli* and enterococci was measured at multiple depths in a freshwater marsh, a brackish water lagoon, and a marine site, all located in California. The marine site had very clear water, while the waters from the marsh and lagoon contained colored dissolved organic matter that not only blocked light but also produced reactive oxygen species. First order decay rate constants of both enterococci and *E. coli* were between 1 and 2 d^{-1} under low light conditions and as high as 6 d^{-1} under high light conditions. First order decay rate constants were well correlated to the daily average UVB light intensity corrected for light screening incorporating water absorbance and depth, suggesting endogenous photoinactivation is a major pathway for bacterial decay. Additional laboratory experiments demonstrated the presence of colored dissolved organic matter in marsh water enhanced photoinactivation of a laboratory strain of *Enterococcus faecalis*, but depressed photoinactivation of sewage-sourced enterococci and *E. coli* after correcting for UVB light screening, suggesting that although the exogenous indirect photoinactivation mechanism may be active against *Ent. faecalis*, it is not for the sewage-source organisms. A simple linear regression model based on UVB light intensity appears to be a useful tool for predicting inactivation rate constants in natural waters of any depth and absorbance.